THE
UNIVERSITY OF MARYLAND
SCHOOL OF CHEMISTRY

QUARTERLY

Issued in the Months of February, May, August and November

Entered at College Park (Md.) Post Office as Second-Class Matter.

No. 98 NOVEMBER 1922

AGRICULTURAL LIME ANALYSES

NEIL E. GORDON, State Chemist

Published for the Benefit of Agriculture, and Sent Free to Anyone Desiring a copy

Names Wanted for Mailing-List

ADDRESS

DEPARTMENT OF CHEMISTRY, UNIVERSITY OF MARYLAND
COLLEGE PARK, MD.

ANALYSES OF

Agricultural Lime Sold in Maryland

BY THE DEPARTMENT OF CHEMISTRY

UNIVERSITY OF MARYLAND

N. E. Gordon, Ph. D., State Chemist
L. B. Broughton, M. S., Professor of Industrial Chemistry.
M. Kharasch, Ph. D., Associate Professor of Organic Chemistry
R. C. Wiley, B. S., Associate Professor of Analytic Chemistry
L. H. Van Wormer, M. S., First Assistant Chemist
R. H. Walls, Assistant Chemist
A. L. Flenner, B. S., Assistant Chemist
D. C. Lichtenwalner, B. S., Instructor in Chemistry
E. C. Donaldson, Inspector
F. G. Baggs, Clerk
R. F. Malone, Stenographer

Before giving the results of the analysis of the samples of lime taken in various parts of the State, a few remarks will be made on the following points: (1) forms of lime; (2) purpose of lime; (3) comparative values of different forms of lime; (4) analysis of lime; (5) what forms of lime to use; (6) how much lime to use.

FORMS OF LIME

Chemically speaking there are three forms in which agriculture lime appears on the market, namely, (1) carbonate of lime or calcium carbonate, $CaCO_3$, (2) quicklime or calcium oxide, CaO, and (3) hydrated lime, "slaked lime" or calcium hydroxide, $Ca(OH)_2$.

(1). *Carbonate of lime, $CaCO_3$,* is obtained by grinding limestone, marl, or oyster shells to a certain fineness. There does not seem to be an agreement by authors as to the proper fineness, but it is well known that the finer the grinding, the more rapidly will the carbonate act on the soil.

(2). *Quicklime or calcium oxide, CaO,* is obtained by heating the carbonate of lime, $CaCO_3$, at a high temperature when the following reaction takes place:

100 lbs.			56 lbs.		44 lbs.
$CaCO_3$ calcium carbonate	+	heat	CaO calcium oxide	+	CO_2 carbon dioxide

100 pounds of calcium carbonate produces 56 pounds of lime (calcium oxide) and 44 pounds of carbon dioxide. The latter passes off as a gas.

Oxide of magnesia, MgO, is generally present in limestone, since it has a neutralizing value about equal to that of calcium oxide, it is counted as lime. Some believe that a too high content of the magnesia oxide to be injurious when used on some soils.

(3). *Hydrated lime, "slaked lime" or calcium hydroxide,* $Ca(OH)_2$, is formed by treating quicklime with water. What takes place might be represented thus:

75.7 lbs. CaO quicklime	+	24.3 lbs. H_2O water		100 lbs. $Ca(OH)_2$ hydrated lime

75.7 pounds of quicklime is equivalent to 100 pounds of hydrated lime.

PURPOSE OF LIME

The primary use of lime is to sweeten the soil or chemically speaking to neutralize the acid of the soil. Few crops will grow on a sour soil. This is especially true of the clover, alfalfa, pea and other legumes, and it is the legume family which has the power of enriching the nitrogen content of the soil, and hence lime indirectly acts as a nitrogen fertilizer. Furthermore, calcium replaces potassium in some compounds in the soil, and hence potassium may become more available for plant food where lime has been used. In the main, lime should not be expected to relieve the necessity for the ordinary fertilizer.

COMPARATIVE VALUES OF DIFFERENT FORMS OF LIME.

Since the principal use of agriculture lime is to neutralize the acid in the soil, its value, other things being equal, depends on the amount of oxide equivalents as obtained by adding together calcium oxide, CaO, and magnesium oxide, MgO. The last column in the tables on analysis gives such a value, and may be used for comparative purposes.

ANALYSIS OF LIME

The sum of the oxides of calcium and magnesium plus the insoluble matter does not make 100 per cent. The difference is due to certain aluminum and iron compounds, water, carbon dioxide, etc. In making lime the carbon dioxide is rarely all driven out, and if lime is exposed to the air before the sample is taken it takes up both water and carbon dioxide from the air rather rapidly. In taking up water, as shown above, it is converted into the hydroxide and by taking up carbon dioxide it is converted into the carbonate, and hence when a sample is analyzed it is likely to contain all three forms of lime. The fact that a sample changes its chemical composition on being exposed to the air, should be given some weight when making comparisons, and when noting guar-

antees. Furthermore, two samples of lime often vary when taken from the same quarry, and hence too much weight should not be given to a few points in favor of a certain brand, for the analysis may be reversed in the next year's bulletin.

WHAT FORM OF LIME TO USE

All three forms of lime just mentioned, namely, the oxide, hydrate and carbonate, are good and the kind to use depends on the comparative values when one has taken into consideration the convenience in handling, the cost of freight and hauling, amount to be used, etc.

HOW MUCH LIME TO USE

One-half to one ton of a good commercial lime is the usual amount used on an acre, while one to two tons of ground limestone or oyster shells are required. If the limestone or oyster shells are coarsely ground, a larger application may be used and then applied less often. Too large applications of lime may do harm by destroying organic matter. It is difficult to say exactly how much should be used without some sort of a test. Information in regard to this may be found on page 13.

The tables on the following pages contain the results of the analysis of agriculture lime for the year ending November, 1922. If in question about which samples are carbonates, refer to page 12, where all carbonates are listed as well as in the main tables.

ANALYSES OF AGRICULTURAL LIME—1922

No.	Name of Manufacturer or Agent.	Name of Lime	Place of Sampling.	Calcium Oxide CaO		Magnesium Oxide MgO		Sand & Insol. (no val.)	Total Oxides Equivalents. CaO+MgO.
				Found.	Guaranteed	Found.	Guaranteed	Found.	
1352	F. D. Adams, Hagerstown, Md.	*Lime Marl.....	Hagerstown	49.28	50.00	.40		5.68	49.68
1320	Alba Marl Lime Co., Charles Town, W. Va.	*Alba Marl.....	Charles Town, W. Va.	53.31	50.00	.15	.50	2.04	53.46
1313	Amer. Agr'l. Chem. Co., Baltimore, Md.	Ground Land Plaster...	Laurel	‡88.48				2.20	
1346	J. E. Baker Co., York, Pa.	Princess Burned Lime..	York, Pa.	92.19	85.00	3.44	3.00	1.04	95.63
1349	" " " " " "	Susquehanna Hyd. Lime	York, Pa.	57.25	50.00	8.69	2.00	2.08	65.94
1348	" " " " " "	Victor Agr. Hyd. Lime.	York, Pa.	57.89	40.00	16.18	25.00	1.16	74.07
1347	" " " " " "	*Victor Fine Gr. Limest.	York, Pa.	47.04	47.00	6.73	2.00	4.72	53.77
1301	Baltimore Lime & Stone Co., Baltimore, Md.	Burnt Lump Lime.....	Texas	71.79		1.38		3.56	73.17
1288	S. W. Barrick & Son, Woodsboro, Md.	Agric. Lump Lime.....	Woodsboro	87.47	85.00	.43	5.00	1.24	87.90
1289	" " " " "	Fresh Ground Lime....	Woodsboro	73.92		8.10		8.58	82.02
1290	" " " " "	Hydrated Lime.....	Woodsboro	59.24	65.00	4.92	3.00	6.50	64.16

*Ground Shells or Stone, Mechanical Analysis on Page 12. ‡Pure Gypsum $CaSO_4$, $2H_2O$.

1311	Baugh & Sons Co., Baltimore, Md.	*Ground Oyster Shell Lime	Mt. Airy	42.00	48.00	.43	.50	15.60	42.43

1311	Baugh & Sons Co., Baltimore, Md.	*Ground Oyster Shell Lime	Mt. Airy	42.00	48.00	.43	.50	15.60	42.43
1307	Beaver Dam Marble Co., Cockeysville, Md.	*Ground Lime Stone	Cockeysville	28.78		20.20		4.08	48.98
1335	F. & H. Benning Oyster & Lime Co., Galloways, Md.	Ground Oyster Shell Lime	Galloways	57.79	50.00	.80		9.76	58.59
1319	Blair Limestone Co., Martinsburg, W. Va.	Opequon Hydrated Lime	Martinsburg, W. Va.	61.37	65.00	1.52	2.00	5.17	62.89
1345	" " "	Shenandoah Ground Lime	Martinsburg, W. Va.	49.90	48.00	33.91	32.00	1.60	83.81
1274	Herbert Bryant's Son, Alexandria, Va.	*Ground Oyster Shell Lime	Crisfield	48.43	45.00	.39		6.88	48.82
	John E. Buffington, Union Bridge, Md.	†Agric. Lump Lime			90.00				
1341	Central Chemical Co., Hagerstown, Md.	Gro-All Hydrated Lime	Hagerstown	69.44	70.00	2.24	2.00	1.68	71.68
	Dorchester Fertilizer & Lime Co., Cambridge, Md.	†Hydrated Oyster Shell Lime			50.00				
1275	" " "	*Pulverized Oyster Shell Lime	Cambridge	40.20		.47		16.82	40.67
1342	East Coast Trading Co., Baltimore, Md.	*Ground Oyster Shell Lime	Baltimore	33.03	50.00	.32		37.06	33.35
1308	Emig Lime Co., Hellam, Pa.	Agric. Lump Lime	Rocks	60.82	86.00	14.87		.98	75.69
1291	Fountain Rock Lime Co., Woodsboro, Md.	Agric. Lump Lime	Fountain Rock	90.39	85.00	4.01	2.00	.86	94.40
1292	" " " "	Fresh Ground Lime	Fountain Rock	58.35		6.11		7.72	64.46
1293	" " " "	Hydrated Lime	Fountain Rock	56.00	60.00	7.80	2.00	6.76	63.80
1343	Thomas I. Fulks, Gaithersburg, Md.	*Ground Oyster Shell Lime	Gaithersburg	48.27	48.00	.43	.50	6.14	48.70
1280	M. J. Grove Lime Co., Lime Kiln, Md.	Agric. Lump Lime	Groves	75.60	75.00	6.25		7.80	81.85
1281	" " " " "	Fresh Ground Lime	Groves	56.55	75.00	7.89		15.32	64.44
1282	" " " " "	Fresh Hydrated Lime	Groves	55.55	65.00	9.33		8.56	64.88

*Ground Shells or Stone, Mechanical Analysis on Page 12. †Licensed but no sample.

ANALYSES OF AGRICULTURAL LIME—1922

No.	Name of Manufacturer. or Agent.	Name of Lime	Place of Sampling.	Calcium Oxide CaO		Magnesium Oxide MgO		Sand & Insol. (no val.)	Total Oxides Equivalents. CaO+MgO.
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	
1294	O. J. Keller Lime Co., Buckeystown, Md.	Agric. Lump Lime....	Buckeystown	87.69	85.00	.70		.20	88.39
1295	" " " " "	Hydrated Lime.....	Buckeystown	69.21	65.00	1.37	1.20	2.36	70.58
1336	Knickerbocker Lime Co., Philadelphia, Pa.	*Ground Limestone.....	Phila., Pa.	30.46	26.00	21.12	18.00	1.56	51.58
1344	" " "	Hydrated Lime.....	Phila., Pa.	48.38	45.00	28.88	30.00	1.32	77.26
1337	" " "	Run of Kiln Lime.....	Phila., Pa.	57.12	50.00	27.22	33.00	1.16	84.34
1321	E. J. Lavino & Co., Philadelphia, Pa.	*Pulverized Limestone...	Phila., Pa.	43.68	40.00	2.64	10.00	15.28	46.32
1296	Legore Combination Lime Co., Legore, Md.	Agric. Lump Lime.....	Legore	87.92	80.00	1.48	1.00	.64	89.40
1314	" " "	Ground Lime.....	Germantown	61.00	85.00	1.89	1.00	9.50	62.89
1297	" " "	Hydrated Lime.....	Legore	60.70	58.00	4.97	1.00	5.56	65.67
1303	Wm. P. Lindsey, Texas, Md.	Burnt Lime.....	Texas	71.45		2.42		15.12	73.87
1304	J. B. Logan Lime Co., Texas, Md.	Burnt Lump Lime.....	Texas	73.33		13.85		5.52	87.20
1305	" " " " "	Hydrated Lime.....	Texas	64.70		6.65		1.60	71.35

*Ground Shells or Stone, Mechanical Analysis on Page 12.

		Hydrated Lime.....	Texas	64.70		6.65		1.60	71.35

*Ground Shells or Stone, Mechanical Analysis on Page 12.

1298	McAleer Lime Co., Walkersville, Md.	Agric. Lump Lime.....	Walkersville	73.36	75.00	8.98		4.80	82.34
1299	" " "	Fresh Ground Lime....	Walkersville	68.73	70.00	2.86		6.44	71.59
1300	" " "	Hydrated Lime.....	Walkersville	61.15	60.00	2.50		12.88	63.65
1354	Merion Lime & Stone Co., Norristown, Pa.	Hydrated Lime.....	Norristown, Pa.	43.12	45.00	29.46	.50	2.38	72.58
1353	" " " " "	Run of Kiln Lime.....	Norristown, Pa.	50.06	50.00	34.44	.50	1.14	84.50
1326	Mich. Limestone & Chem. Co., Buffalo, N. Y.	*Calcite Mich. Limestone	Buffalo, N. Y.	54.20	54.50	.47	1.00	.92	54.67
	Henry Mosser, Oakland, Md.	†Agric. Burnt Lime.....			75.00				
1322	Natural Lime-Marl Co., Roanoke, Va.	*Lime-Marl	Roanoke, Va.	51.86	50.00	.60		3.20	52.46
1316	W. E. Northum, Benedict, Md.	*Ground Oyster Shell Lime	Benedict	48.27		.25		7.20	48.52
1276	Orem & Winterbottom, Cambridge, Md.	Burnt Shell Lime.....	Cambridge	55.32	60.00	.40		9.08	55.72
1324	Palmer Lime & Cement Co., York, Pa.	Agric. Lime.....	York, Pa.	70.11	88.00	4.15	6.00	.50	74.26
1306	" " " " "	Chal. Br. Hydrat. Lime.	Bel Air	71.45	70.00	2.17	3.00	.24	73.62
1325	" " " " "	*Ground Limestone.....	York, Pa.	48.04	48.00	5.80	5.00	1.57	53.84
	Peerless Oyster Co., Baltimore, Md.	†Unburnt Oyster Shell Lime			49.50				
	Potomac Co., Harpers Ferry, W. Va.	†Hydrated Lime.....			68.00		2.00		
1279	Potomac Poultry Food Co., Baltimore, Md.	Ground Oyster Shell Lime	Boyds	45.36	48.00	.43		7.08	45.79
1317	Powhatan Lime Co., Strasburg Junction, Va.	Agric. Ground Lime...	Strasburg Jct., Va.	85.68	65.00	1.16	5.00	.80	86.84
1310	H. S. Rawlings, Pinto, Md.	Burned Lime.....	Pinto	58.69		1.43		16.50	60.12
	Riverton Lime Co., Inc., Riverton, Va.	†Perfection Hydrated Lime			55.00		10.00		

*Ground Shells or Stone, Mechanical Analysis on Page 12.

†Licensed but no sample.

ANALYSES OF AGRICULTURAL LIME—1922

No.	Name of Manufacturer. or Agent.	Name of Lime	Place of Sampling.	Calcium Oxide CaO		Magnesium Oxide MgO		Sand & Insol (no val.)	Total Oxides Equivalents. CaO+MgO.
				FOUND.	Guaranteed.	FOUND.	Guaranteed.	FOUND.	
1277	Salisbury Lime Co., Salisbury, Md.	Hydrated Shell Lime...	Salisbury	**57.90**		**.36**		**7.12**	**58.26**
1327	Security Cement & Lime Co., Hagerstown, Md.	Berkeley Hydra-Calcite Lime	Hagerstown	**62.72**	52.00	**3.60**	2.00	**2.60**	**66.32**
1328	" " " "	Berkeley Hydrated Lime	Hagerstown	**70.56**	70.00	**2.66**	2.00	**.64**	**73.22**
1329	" " " "	*Berkeley Pul. Limestone	Hagerstown	**43.90**	44.00	**4.48**		**10.40**	**48.38**
1284	Shank & Etzler, Frederick, Md.	Agric. Lump Lime.....	Frederick	**52.86**	60.00	**35.10**	30.00	**3.86**	**87.96**
1285	" " " "	Fresh Ground Lime....	Frederick	**49.86**	55.00	**30.26**	25.00	**6.52**	**80.12**
1286	" " " "	Hydrated Lime.....	Frederick	**42.44**	40.00	**25.95**		**9.04**	**68.39**
1315	Standard Lime & Stone Co., Buckeystown, Md.	*Pulverized Limestone..	Rockville	**51.96**	50.00	**.63**		**4.10**	**52.59**
1323	Steacy & Wilton Co., Wrightsville, Pa.	Run of Kiln Lump Agric. Lime.....	Wrightsville, Pa.	**92.51**	80.00	**2.56**		**1.14**	**95.07**
1309	" " " "	Sterling Hydrated Lime	Westminster	**66.42**	70.00	**3.80**	2.00	**1.52**	**70.22**
	Chas. E. Staley, Frederick, Md.	†Agric. Lump Lime.....			90.00		2.08		
1287	Tidewater Portland Cement Co., Union Bridge, Md.	Hydrated Lime.....	Rocky Ridge	**68.98**	71.00	**1.55**	5.00	**1.64**	**70.53**

*Ground Shells or Stone, Mechanical Analysis on Page 12. †Licensed but no sample.

1351	" " "	Lump Lime.....	Union Bridge	**94.86**	92.00	**1.20**	1.00	**1.02**	**96.06**
1278	Tilghman Lime Co.,	Diamond Br. Hyd. Shell	Fruitland	**60.59**	60.00	**.36**	1.00	**7.08**	**60.95**

*Ground Shells or Stone, Mechanical Analysis on Page 12.

†Licensed but no sample.

1351	" " "	Lump Lime.....	Union Bridge	**94.86**	92.00	**1.20**	1.00	**1.02**	**96.06**
1278	Tilghman Lime Co., Fruitland, Md.	Diamond Br. Hyd. Shell Lime	Fruitland	**60.59**	60.00	**.36**	1.00	**7.08**	**60.95**
1334	United States Gypsum Co., Chicago, Ill.	Ben Frank. Agric. Gypsum	Chicago, Ill.	‡**86.13**	‡86.02			3.00	
1356	Valley Lime Marl Co., Baltimore, Md.	*Lime Marl.....	Baltimore	**52.30**	50.00	**.50**	.	**1.84**	**52.80**
1355	W. H. Valliant & Bro., Bellevue, Md.	Burnt & Ground Shell Lime	Bellevue	**45.58**		**.58**		**11.76**	**46.16**
1312	" " " " "	*Ground Oyster Shell Lime	Bellevue	**46.25**	50.00	**.43**		**10.67**	**46.68**
1330	Chas. Warner Co., Wilmington, Del.	Limoid-Inoculated	Wilmington, Del.	**44.24**	42.00	**32.07**	28.00	**2.00**	**76.31**
1333	" " "	Limoid	Wilmington, Del.	**45.02**	42.00	**33.01**	28.00	**1.40**	**78.03**
1332	" " "	Pulverized Burnt Lime.	Wilmington, Del.	**52.54**	54.00	**36.67**	36.00	**1.72**	**89.21**
1350	" " "	*Pulverized Limestone...	Wilmington, Del.	**29.68**	29.00	**20.63**	19.00	**3.40**	**50.31**
1331	" " "	Run of Kiln Lime.....	Wilmington, Del.	**53.42**	56.00	**35.54**	37.00	**4.40**	**88.96**
1339	Washington Building Lime Co., Buckeystown, Md.	Ground Lime.....	Buckeystown	**92.39**	90.00	**3.22**		**1.06**	**95.61**
1340	" " "	Standard Hydrated Lime	Buckeystown	**69.22**	70.00	**2.21**		**1.68**	**71.43**
1338	" " "	Standard Lump Lime...	Buckeystown	**92.74**	90.00	**2.27**		**1.00**	**95.01**

*Ground Shells or Stone, Mechanical Analysis on Page 12.

‡Pure Gypsum $CaSO_4$, $2H_2O$.

TABLE II—SHOWING MECHANICAL ANALYSIS OF GROUND LIMESTONE AND GROUND OYSTER SHELL

For the Chemical Analyses of these samples, see preceding table.
Figures are percentages or pounds per hundred.
"Mesh" indicates the sieve used: "20 Mesh" has 20 wires to the inch.

No.	Name of Manufacturer or Agent.	Name of Lime or Kind.	Finer than 100 Mesh	Bet. 80 and 100 Mesh	Bet. 60 and 80 Mesh	Bet. 40 and 60 Mesh	Bet. 20 and 40 Mesh	Coarser than 20 Mesh
1352	F. D. Adams, Hagerstown, Md.....	Lime Marl.....	43	4	5	12	20	16
1320	Alba Marl Lime Co., Charles Town, W. Va.	Alba Marl.....	68	3	3	5	13	8
1347	J. E. Baker Co., York, Pa.....	Victor Fine Gr. Limestone..	74	3	4	7	10	2
1311	Baugh & Sons Co., Baltimore, Md.....	Ground Oyster Shell Lime..	29	10	12	16	27	6
1307	Beaver Dam Marble Co., Cockeysville, Md.	Ground Limestone.....	10	4	3	11	40	32
1274	Herbert Bryant's Son, Alexandria, Va...	Ground Oyster Shell Lime..	24	8	4	17	28	19
1275	Dorch'er Fert. & Lime Co., Cambridge, Md.	Pulverized Oyster Shell Lime	36	7	8	26	22	1
1342	East Coast Trading Co., Baltimore, Md...	Ground Oyster Shell Lime..	30	10	16	27	16	1
1343	Thos. I. Fulks, Gaithersburg, Md.....	Ground Oyster Shell Lime..	20	5	8	20	39	8
1336	Knickerbocker Lime Co., Philadelphia, Pa.	Ground Limestone.....	94	2	2	2	0	0
1321	E. J. Lavino & Co., Philadelphia, Pa.....	Pulverized Limestone.....	79	13	5	2	1	0
1326	Mich. Limestone & Chem. Co., Buffalo, N.Y.	Calcite Mich. Limestone...	59	4	6	11	15	5
1322	Natural Lime-Marl Co., Roanoke, Va....	Lime-Marl	57	3	4	11	17	8
1316	W. E. Northum, Benedict, Md.....	Ground Oyster Shell Lime..	18	4	3	9	15	51
1325	Palmer Lime & Cement Co., York, Pa....	Ground Limestone.....	60	5	4	5	10	16
1279	Potomac Poultry Food Co., Baltimore, Md.	Ground Oyster Shell Lime..	34	6	8	19	26	7
1329	Security Cem. & Lime Co., Hag'stown, Md.	Berkeley Pul. Limestone...	89	6	4	1	0	0
1315	Stand. Lime & Stone Co., Buck'stown, Md.	Pulverized Limestone.....	45	10	13	23	9	0
1356	Valley Lime Marl Co., Baltimore, Md....	Lime Marl.....	49	4	4	5	9	29
1312	W. H. Valliant & Bro., Bellevue, Md.....	Ground Oyster Shell Lime..	20	4	4	9	20	43
1350	Chas. Warner Co., Wilmington, Del.....	Pulverized Limestone.....	92	3	3	2	0	0

MARYLAND SOILS NEED LIME

At least two-thirds of the farm land in Maryland must have an application of lime before maximum crops can be produced. The poor and unproductive land of the State is invariably sour, and many of the good soils could be made more productive by the liberal use of lime. When a soil begins to need lime it is a waste of time and energy to continue to cultivate it until this need has been supplied, since the economic use of both manure and fertilizers is dependent upon the lime supply of the soil.

HAVE YOUR SOIL TESTED

If your soil is needing lime you should know it and supply the need. If, on the other hand, the lime requirement of your soil has been met, you should know it and invest your money in fertilizers rather than in additional amounts of lime.

You are invited to send a sample of your soil to the Experiment Station for a lime requirement test. This service is free.

DIRECTIONS FOR TAKING SOIL SAMPLES

With a spade or a shovel open a hole in the soil to the depth of about six inches, lay a piece of clean paper in the bottom and then shave a thin slice from one side of the hole, allowing the soil to fall on the paper. Lift the paper and soil slice from the hole and proceed to another place in the same field and repeat the operation.

If the field is small and fairly uniform two holes will be sufficient to give a representative sample, but if the field is large and uneven it will be better to secure samples from at least four different places. The samples thus secured from different places in the same field should then be mixed together, and from the mixture a half pint of soil should be taken for the test. This half-pint sample should be wrapped in paper or put in a clean bag and numbered or marked on the outside of the package. The samples from each field should be wrapped and numbered separately, then all packed together in a box or package for shipment.

The following information should accompany each sample:

(1) Location of your farm.
(2) Size of the field.
(3) When was lime last applied?
(4) Amount of lime used.
(5) Does clover grow well on this field?

Send your package to your County Agricultural Agent or direct to

THE SOILS DEPARTMENT, MARYLAND EXPERIMENT STATION,
COLLEGE PARK, MARYLAND.

For further information regarding lime and the liming of soils write to the Maryland Experiment Station for Bulletins No. 242 and 247, or to the Extension Service for Bulletin No. 2.